



# STIC Search Report

## EIC 3700

STIC Database Tracking Number: 156498

**TO:** Darwin Erezo  
**Location:** RND 6c70  
**Art Unit:** 3731  
**Friday June 17, 2005**

**Case Serial Number:** 09/967274

**From:** John Sims  
**Location:** EIC 3700  
**RND 8B31**  
**Phone:** 571 272-3507

**john.sims@uspto.gov**

### Search Notes

Please examine your results carefully. Search terms are highlighted in boldface type.

**Erezo, Darwin**

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**From:** Sims, John  
**Sent:** Friday, June 17, 2005 1:01 PM  
**To:** Erezo, Darwin  
**Subject:** 09/967,274--CO2 based bi-level CPAP control

Darwin--

We did a search on this method/device case (CPAP, CO2 sensing and CO2 threshold value) but did not find any good art.

I will provide a more complete report on Monday.

John Sims, Team Leader  
EIC 3700  
Randolph Bldg. 8b35  
571 272-3507

RUSH  
needs by noon 6/11  
Access DB# 156498

## SEARCH REQUEST FORM

### Scientific and Technical Information Center

Requester's Full Name: DARWIN ER E ZO Examiner #: 78496 Date: 6/14/05  
Art Unit: 3731 Phone Number 30 24695 Serial Number: 60/967,274  
Mail Box and Bldg/Room Location: RAND 6C70 Results Format Preferred (circle): PAPER DISK  E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: CARBON DIOXIDE - BASED BI-LEVEL CPAP CONTROL

Inventors (please provide full names): JOSEPH B. WOODWARD RICHLEY II

Earliest Priority Filing Date: 09/28/2000

\*For Sequence Searches Only\* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.

THIS IS A CPAP DEVICE (CONTINUOUS POSITIVE AIR PRESSURE)

- METHOD + DEVICE: BOTH ~~WANTS~~ SENSES CO<sub>2</sub> LEVEL TO DETECT INSPIRATION / EXPIRATION
- THEN COMPARES THIS LEVEL TO A PREDETERMINED THRESHOLD VALUE.
- CLAIMS ARE ATTACHED.

\* This is an AF request  
Please RUSH

Alt. T - T. very  
SPE Ac 3731

#### STAFF USE ONLY

Searcher: J Sim

Searcher Phone #: 23507

Searcher Location: RND 8B35

Date Searcher Picked Up:

Date Completed: 6/17/05

Searcher Prep & Review Time:

Clerical Prep Time:

Online Time:

#### Type of Search

NA Sequence (#)

AA Sequence (#)

Structure (#)

Bibliographic ✓

Litigation

Fulltext ✓

Patent Family:

Other

#### Vendors and cost where applicable

STN ✓

Dialog ✓

Questel/Orbit

Dr. Link

Lexis/Nexis

Sequence Systems

WWW/Internet

Other (specify)

23/3, K/18 (Item 1 from file: 266)

DIALOG(R) File 266:FEDRIP

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00481346

IDENTIFYING NO.: 144381; 0049; 607 AGENCY CODE: VA

**Effect of Continuous Positive Airway Pressure (CPAP) on  
Endothelial Function**

PRINCIPAL INVESTIGATOR: Skatrud, James B., M.D.

PERFORMING ORG.: Department of Veterans Affairs, Medical Center Madison, WI

SPONSORING ORG.: Department of Veterans Affairs, Research and Development (15), 810 Vermont Ave. N.W., Washington, D.C. 20420 United States of America

DATES: 20011107

**Effect of Continuous Positive Airway Pressure (CPAP) on  
Endothelial Function**

SUMMARY: SLEEP APNEA SYNDROMES; ENDOTHELIUM, VASCULAR; CEREBROVASCULAR CIRCULATION

OBJECTIVES: To determine whether elimination of sleep apnea with nasal **continuous positive airway pressure (CPAP)** improves vascular function in the forearm and cerebral circulation in patients with sleep apnea syndrome.

Research Design: This is a prospective, unblinded study.

METHODOLOGY: Twenty patients with recently diagnosed, moderate-to-severe sleep apnea (40-60 events per hour), in whom **CPAP** treatment is clinically indicated, will participate. Subjects must be normotensive (average blood pressure, **measured** on 3 separate screening visits less than 140/90) non-smokers. Subjects will be excluded if they have a history of diabetes mellitus, cerebrovascular disease, angina, myocardial infarction, ventricular dysfunction, or hyperlipidemia (defined as the 75th percentile for age and gender). Subjects with carotid bruits will also be excluded. Before **CPAP** treatment is initiated, cerebrovascular reactivity to **increases** and **decreases** in **carbon dioxide level (CO<sub>2</sub>)** will be **measured** noninvasively using Doppler ultrasound. This test involves breathing **increased** CO<sub>2</sub> at 2 levels titrated to produce **increases** of +5 and +10 mmHg in end-tidal CO<sub>2</sub> tension (5 minutes each) and the use of 2 levels of voluntary overbreathing to lower the...

... tension by -5 and -10 mmHg below baseline (5 minutes each). In another test on the same day, blood flow in the forearm will be **measured** noninvasively using Doppler ultrasound before and after vascular occlusion of the forearm (4.5 minutes) and administration of sublingual nitroglycerin. Both vascular studies will be repeated after 6 weeks of in-home **CPAP** treatment.

1/7/1

DIALOG(R) File 266:FEDRIP

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00481346

IDENTIFYING NO.: 144381; 0049; 607 AGENCY CODE: VA

**Effect of Continuous Positive Airway Pressure (\*CPAP\*) on \*Endothelial\*  
\*Function\***

PRINCIPAL INVESTIGATOR: Skatrud, James B., M.D.  
PERFORMING ORG.: Department of Veterans Affairs, Medical Center Madison,  
WI

SPONSORING ORG.: Department of Veterans Affairs, Research and Development  
(15), 810 Vermont Ave. N.W., Washington, D.C. 20420 United States of  
America

DATES: 20011107

SUMMARY: SLEEP APNEA SYNDROMES; ENDOTHELIUM, VASCULAR; CEREBROVASCULAR  
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myocardial infarction, ventricular dysfunction, or hyperlipidemia (defined  
as the 75th percentile for age and gender). Subjects with carotid bruits  
will also be excluded. Before CPAP treatment is initiated, cerebrovascular  
reactivity to increases and decreases in carbon dioxide level (CO<sub>2</sub>) will be  
measured noninvasively using Doppler ultrasound. This test involves  
breathing increased CO<sub>2</sub> at 2 levels titrated to produce increases of +5 and  
+10 mmHg in end-tidal CO<sub>2</sub> tension (5 minutes each) and the use of 2 levels  
of voluntary overbreathing to lower the end-tidal CO<sub>2</sub> tension by -5 and -10  
mmHg below baseline (5 minutes each). In another test on the same day,  
blood flow in the forearm will be measured noninvasively using Doppler  
ultrasound before and after vascular occlusion of the forearm (4.5 minutes)  
and administration of sublingual nitroglycerin. Both vascular studies will  
be repeated after 6 weeks of in-home CPAP treatment.

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18/7/1 (Item 1 from file: 5)  
DIALOG(R)File 5:Biosis Previews(R)  
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0011218178 BIOSIS NO.: 199800012425

**Improvement of exercise performance with short-term nasal continuous positive airway pressure in patients with obstructive sleep apnea**

AUTHOR: Taguchi Osamu; Hida Wataru; Okabe Shinichi; Ebihara Satoru; Ogawa

Hiromasa; Kikuchi Yoshihiro; Shirato Kunio

AUTHOR ADDRESS: First Dep. Internal Med., Tohoku Univ. Sch. Med., 1-1 Seiryomachi, Aoba-ku, Sendai 980-77, Japan\*\*Japan

JOURNAL: Tohoku Journal of Experimental Medicine 183 (1): p45-53 Sept.,

1997 1997

MEDIUM: print

ISSN: 0040-8727

DOCUMENT TYPE: Article

RECORD TYPE: Abstract

LANGUAGE: English

**ABSTRACT: We examined the effects of nasal continuous positive airway**

**pressure (CPAP) on exercise performance in patients with obstructive**

**sleep apnea (OSA). Six patients were treated with nasal CPAP on seven**

**successive days and underwent overnight sleep studies and multiple sleep**

**latency test (MSLT) at the beginning and after the last day of the treatment. The subjects also performed incremental exercise testing using**

**a bicycle ergometer followed by 0-w, 25-w, 50-w, - (3 minutes each) until**

**maximum level. Arterial oxygen pressure, arterial carbon dioxide**

**pressure at rest while awake, apnea/hypopnea index, longest apnea duration, the lowest percutaneous oxygen saturation measured by a pulse**

**oximeter and the value of MSLT were significantly improved after nasal**

**CPAP. Moreover, maximal oxygen consumption was significantly increased**

**from 1841 ml/min+-350 to 2125 ml/min+-351 (p<0.05); however, other cardiorespiratory parameters did not change significantly. The improvement of exercise performance by short-term nasal CPAP treatment**

**in OSA patients may correlate with the improvement of sleepiness.**

18/7/2 (Item 2 from file: 5)

DIALOG(R)File 5:Biosis Previews(R)

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0006125148 BIOSIS NO.: 198885094039

**THE DOSE RESPONSE OF THEOPHYLLINE IN THE TREATMENT OF APNEA OF PREMATURITY**

AUTHOR: MUTTITT S C (Reprint); TIERNEY A J; FINER N N

AUTHOR ADDRESS: DEP NEWBORN MED, ROYAL ALEXANDRA GENERAL HOSP, 10240 KINGSWAY AVE, EDMONTON, ALBERTA T5H 3V9, CAN\*\*CANADA

JOURNAL: Journal of Pediatrics 112 (1): p115-121 1988

ISSN: 0022-3476

DOCUMENT TYPE: Article

RECORD TYPE: Abstract

LANGUAGE: ENGLISH

**ABSTRACT:** In an effort to establish the minimum effective dose of theophylline in the treatment of idiopathic apnea of prematurity, a prospective trial of 22 infants with at least 0.33 episodes of apnea per

hour were studied. Apnea was diagnosed exclusively by continuous recording of heart rate, respiratory impedance, end-tidal **CO<sub>2</sub>**, and either or both transcutaneous oxygen and pulse **oximetry**. Four discrete

serum concentrations of theophylline (23 .mu.mol/L or 4.2 mg/L, 47 .mu.mol/L or 8.5 mg/L, 70 .mu.mol/L or 12.7 mg/L, and 84 .mu.mol/L or

15.3 mg/L) were attained by using repeated loading doses of 4 mg/kg and

increasing the maintenance dose from 1 to 1.5 mg/kg to 2 to 2.5 mg/kg,

given every 8 hours. Before treatment and 24 hours after each loading

dose, airway occlusions and measures of tidal volume, minute ventilation,

and respiratory timing were performed. The effectiveness of therapy was

assessed by either a continuous computer data-acquisition system or paper

recording for the duration of the study. Of the 22 infants, three responded at **level 1**, three at **level 2**, and 10 at **level 3**. One of

the four infants loaded to the fourth **level** had a sustained response

for a total cumulative response of 77%. The five remaining infants required additional treatment with doxapram or **continuous positive airway pressure**.

There was a significant increase in inspiratory pressure 100 msec after airway occlusion, maximum inspiratory pressure during airway occlusion, tidal volume, ratio of tidal volume to inspiratory time (mean inspiratory flow), and minute ventilation from the

pretreatment measurements to those at the maximum dose of theophylline.

The apnea response did not correlate with these improvements in

ventilation measures.

18/7/3 (Item 1 from file: 34)  
DIALOG(R) File 34:SciSearch(R) Cited Ref Sci  
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12591619 Genuine Article#: 803HB Number of References: 50

**Title: Neonatal resuscitation: raising the bar**

Author(s): Finer NN (REPRINT) ; Rich WD  
Corporate Source: 200 W Arbor Dr/San Diego//CA/92103 (REPRINT); Univ Calif

San Diego, Med Ctr, Dept Pediat, Div Neonatol, San Diego//CA/92103  
Journal: CURRENT OPINION IN PEDIATRICS, 2004, V16, N2 (APR), P157-162  
ISSN: 1040-8703 Publication date: 20040400  
Publisher: LIPPINCOTT WILLIAMS & WILKINS, 530 WALNUT ST, PHILADELPHIA, PA

19106-3621 USA

Language: English Document Type: REVIEW

Abstract: Purpose of review To provide an overview of neonatal resuscitation practices with an emphasis on interventions that are not currently accepted or adapted into existing resuscitation guidelines.

Recent findings Current resuscitation guidelines do not contain specific guidelines for the approach to the extremely low birth weight infant. The differences in environment and management between the neonatal ICU and delivery room are striking and are magnified in the resuscitation of extremely low birth weight infants for whom maintenance of a neutral thermal environment is essential. The use of a polyethylene wrap applied at delivery has been shown to reduce the occurrence of hypothermia and decrease mortality. There is substantial evidence that term and near-term newborn infants can be effectively resuscitated with room air, and recent follow-up studies have demonstrated that this approach is not associated with increased significant differences in neurologic handicap, somatic growth, or developmental milestones when compared with the use of 100% oxygen. The safety and potential benefits of this approach require prospective evaluation in the premature and especially extremely low birth weight infant. There is preexisting evidence that demonstrates that the use of prolonged inflations and t-piece resuscitators may be advantageous during resuscitation, but not all guidelines support these interventions. Although regulated **continuous positive airway pressure**, pulse oximeters, and blenders are routinely used once

an

infant is admitted to the neonatal ICU, none of these interventions is

recommended in the delivery area. Although prospective studies have

demonstrated that the use of colorimetric **CO2 detectors** significantly decreases the time to recognize misplaced endotracheal

tubes placed during resuscitation, their use is not required by current

guidelines. The duration of an intubation attempt during resuscitation

had never been prospectively evaluated, and our recent findings suggest

that a limit of 30 seconds is well tolerated and provides adequate time

for a successful attempt.

Summary There is significant potential for improvement in current

resuscitation environments and interventions that will only be realized

through further prospective research.

**18/7/4 (Item 2 from file: 34)**

DIALOG(R)File 34:SciSearch(R) Cited Ref Sci

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04816622 Genuine Article#: UJ946 Number of References: 36

**Title: FACE-STRAIGHT-DOWN AND FACE-NEAR-STRAIGHT-DOWN POSITIONS IN HEALTHY,**

**PRONE-SLEEPING INFANTS**

Author(s): WATERS KA; GONZALEZ A; JEAN C; MORIELLI A; BROUILLETTE RT

Corporate Source: MONTREAL CHILDRENS HOSP, ROOM C-90, 2300 TUPPER

ST/MONTREAL/PQ H3H 1P3/CANADA/; MONTREAL CHILDRENS HOSP/MONTREAL/PQ H3H

1P3/CANADA/; MCGILL UNIV, DEPT PEDIAT/MONTREAL/PQ H3A 2T5/CANADA/

Journal: JOURNAL OF PEDIATRICS, 1996, V128, N5 (MAY), P616-625

ISSN: 0022-3476

Language: ENGLISH Document Type: ARTICLE

Abstract: Objective: To determine the frequency and physiologic consequences of the face-straight-down (FSD) position, a postulated

mechanism for the sudden infant death syndrome in prone-sleeping infants.

Study design: A survey of 151 infants, aged 1 to 7 months, in Montreal showed that 33% slept prone. Ten healthy prone-sleeping infants were studied in their homes at age 10 to 22 weeks.

**Infrared**

video and cardiorespiratory recordings were made on 3 consecutive nights in the prone (nights 1 and 3) and lateral (night 2) positions.

Results: Infants maintained the prone position during 17 of 19

studies, but only 4 of 9 infants maintained the lateral position.  
The

FSD position was observed 27 times in 17 prone nights: median frequency, 0.6 times per night (interquartile range, 0 to 4), and median total duration, 3.3 minutes (0.8% of total sleep time). A related position, the face-near-straight-down (FNSD) position, occurred

more often, 5.3 (1 to 10) times per prone night, for 22.4 minutes (5.8%

of total sleep time). Most periods in the FSD or FNSD position had no

physiologic consequences; however, 14% of FSD and 3% of FNSD episodes

were associated with airway obstruction as indicated by snoring, paradoxical respiratory movements, apnea, and/or increased partial pressure of transcutaneous **carbon dioxide**. Spontaneous arousal and

head turning terminated the FSD and FNSD episodes.

Conclusion: The FSD and FNSD positions occur commonly in healthy

prone-sleeping infants, and these positions can cause airway obstruction. We speculate that those infants with sudden infant death

syndrome found in the FSD or FNSD position either have a congenital or

an acquired defect in the arousal-head turning response or have encountered insurmountable environmental factors that prevent effective head turning.

**18/7/5** (Item 3 from file: 34)

DIALOG(R)File 34:SciSearch(R) Cited Ref Sci  
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04319239 Genuine Article#: RV455 Number of References: 119

**Title: SLEEP AND BREATHING - CENTRAL SLEEP-APNEA, PATHOGENESIS AND TREATMENT - AN OVERVIEW AND PERSPECTIVE**

Author(s): DEBACKER WA

Corporate Source: UNIV INSTELLING ANTWERP,DEPT PULM MED,UNIV PL 1/B-2610

WILRIJK//BELGIUM/

Journal: EUROPEAN RESPIRATORY JOURNAL, 1995, V8, N8 (AUG), P1372-1383

ISSN: 0903-1936

Language: ENGLISH Document Type: REVIEW

Abstract: The prevalence of reported sleep disturbances in a general population is high. Many of the complaints are the result of sleep-related breathing disorders, due mainly to the occurrence of obstructive and central apnoeas. Obstructive sleep apnoea is a fully

described and well-recognized entity. Central sleep apnoea (CSA) however, has been poorly studied.

There is accumulating evidence that central sleep apnoea should be

considered as the end of a spectrum, Instability in the breathing pattern is the main underlying mechanism and is due to the interaction

of many factors, Breathing during sleep is dependent on metabolic control and the activity of the respiratory muscles, Decreased chemical

drive and/or failing respiratory muscle function are associated with

CSA and usually also with ongoing hypoventilation during wakefulness,

characterized by chronic daytime hypercapnia Central respiratory drive

can also be inhibited by upper airway reflexes, Mostly, however, CSA

occurs as the hallmark of unstable breathing during sleep brought about

by an overall increase in loop gain (especially in light sleep stages)

and the unmasking of a **CO<sub>2</sub> threshold** .

Arousal following central apnoeas acts as an amplification of the

instability, Micro electroencephographic (EEG) arousals are often observed as a consequence of CSA, They are responsible for sleep fragmentation and hypersomnolence during the day, The daytime hypersomnolence and complaints of awakenings during sleep in

patients

with CSA can be striking, CSA can occur in specific pathologies, such

as chronic heart failure and (post-traumatic) brain lesions, that are

associated with irregular breathing.

Treatment strategies are remarkably few in number, Use of nasal

ventilation and the inhalation of **CO<sub>2</sub>** are mainly of theoretical interest, since patients do not often tolerate these more invasive therapies, Drug treatment, especially with acetazolamide, is easier to

perform, Stimulation of upper airway reflexes, by less invasive methods, seems to be promising for the near future.

**18/7/6 (Item 4 from file: 34)**

DIALOG(R)File 34:SciSearch(R) Cited Ref Sci  
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02169204 Genuine Article#: KG019 Number of References: 13

**Title: END-TIDAL CO<sub>2</sub> ANALYSIS IN SLEEP-APNEA SYNDROME - CONDITIONS FOR**

**USE**

Author(s): MAGNAN A; PHILIPJOET F; REY M; REYNAUD M; PORRI F; ARNAUD A

Corporate Source: CHU NORD, SERV PNEUMOLOGIE/F-13326 MARSEILLE  
15//FRANCE/;  
CHU NORD, SERV PNEUMOLOGIE/F-13326 MARSEILLE 15//FRANCE/; CHU  
NORD, SERV  
NEUROPHYSIOL/F-13326 MARSEILLE 3//FRANCE/  
Journal: CHEST, 1993, V103, N1 (JAN), P129-131  
ISSN: 0012-3692  
Language: ENGLISH Document Type: ARTICLE  
Abstract: The diagnosis of sleep apnea syndrome (SAS) requires  
expensive  
and complex instrumentation. The purpose of the present study was  
to  
determine the value of end-tidal **CO<sub>2</sub>** (EtCO<sub>2</sub>) in screening for  
sleep  
apneas. Thirty-nine patients referred to our sleep laboratory  
because  
of suspected SAS and ten normal subjects were studied. The EtCO<sub>2</sub>  
was  
measured using an **infrared** spectrometer (POET) designed for  
simultaneous measurement of CO<sub>2</sub> and pulse oximetry. In 29  
subjects,  
expired gas was sampled with a nasobuccal mask (Respiron) with  
lateral  
orifices. In the other 20 subjects, sampling was done with  
nasobuccal  
prongs (Criticare) comprising a four-channel plastic tube to the  
mouth  
and the nostrils. Data from an 8-h night were transferred the  
following  
day to a microcomputer (Apple Macintosh) for processing. Apnea was  
defined as an absence of **detection** of **CO<sub>2</sub>** for more than 10 s.  
Conventional polysomnography was performed (Respisomnographe). The  
number of apneas in 8 h and the apnea index (number of apneas in 1  
h)  
were calculated after visual analysis on the screen of the  
polysomnograph and also with EtCO<sub>2</sub> analysis. For recordings made  
with a  
nasobuccal mask, the regression curve between the apnea indices  
computed with EtCO<sub>2</sub> and polysomnography was an order 2 polynomial  
curve  
( $r = 0.76$ ;  $p < 0.001$ ), with an inflection point at 39 apneas per  
hour.  
For recordings with nasobuccal prongs, the correlation was very  
significant ( $r = 0.95$ ;  $p < 0.0001$ ), and the regression curve was  
linear.  
The EtCO<sub>2</sub> with nasobuccal prongs appears to be a simple and  
reliable  
method for screening for SAS.

18/7/7 (Item 5 from file: 34)  
DIALOG(R)File 34:SciSearch(R) Cited Ref Sci  
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00938137   Genuine Article#: FH216   Number of References: 0  
(NO REFS KEYED)

**Title: ACCURACY OF END-TIDAL CARBON - DIOXIDE TENSION ANALYZERS**

Author(s): RAEMER DB; CALALANG I

Corporate Source: BRIGHAM & WOMENS HOSP, DEPT ANESTHESIA, 75 FRANCIS ST/BOSTON//MA/02115

Journal: JOURNAL OF CLINICAL MONITORING, 1991, V7, N2, P195-208

Language: ENGLISH   Document Type: ARTICLE

Abstract: Substantial mean differences between arterial **carbon dioxide**

tension (PaCO<sub>2</sub>) and end-tidal **carbon dioxide** tension (PETCO<sub>2</sub>) in

anesthesia and intensive care settings have been demonstrated by a number of investigators. We have explored the technical causes of error in the measurement of PETCO<sub>2</sub> that could contribute to the observed differences. In a clinical setting, the measurement of PETCO<sub>2</sub>

is accomplished with one of three types of instruments, **infrared** analyzers, mass spectrometers, and Raman spectrometers, whose specified

accuracies are typically +/- 2, +/- 1.5, and +/- 0.5 mm Hg, respectively. We examined potential errors in PETCO<sub>2</sub> measurement with

respect to the analyzer, sampling system, environment, and instrument.

Various analyzer error sources were measured, including stability, warm-up time interference from nitrous oxide and oxygen, pressure, noise, and response time. Other error sources, including calibration,

resistance in the sample catheter, pressure changes, water vapor, liquid water, and end-tidal detection algorithms, were considered and

are discussed. On the basis of our measurements and analysis, we estimate the magnitude of the major potential errors for an uncompensated **infrared** analyzer as: inaccuracy, 2 mm Hg; resolution,

0.5 mm Hg; noise, 2 mm Hg; instability (12 hours), 3 mm Hg; miscalibration, 1 mm Hg; selectivity (70% nitrous oxide), 6.5 mm Hg;

selectivity (100% oxygen), - 2.5 mm Hg; atmospheric pressure change, <

1 mm Hg; airway pressure at 30 cm H<sub>2</sub>O, 2 mm Hg; positive end-expiratory

pressure or **continuous positive airway pressure** at 20 cm H<sub>2</sub>O,

1.5 mm Hg; sampling system resistance, < 1 mm Hg; and water vapor, 2.5

mm Hg. In addition to these errors, other systematic mistakes such as

an inaccurate end-tidal detection algorithm, poor calibration technique, or liquid water contamination can lead to gross inaccuracies. In a clinical setting, unless the user is confident that

all of the technical error sources have been eliminated and the

physiologic factors are known, depending on PETCO<sub>2</sub> to determine PaCO<sub>2</sub>  
is not advised.

18/7/8 (Item 1 from file: 73)  
DIALOG(R) File 73:EMBASE  
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12139569 EMBASE No: 2003250503  
Continuous positive airway pressure **during bronchoalveolar lavage**  
**in patients with severe hypoxemia**  
An C.H.; Lim S.Y.; Suh G.Y.; Park G.Y.; Park J.W.; Jeong S.H.; Lim S.Y.;  
Oui M.; Koh W.-J.; Chung M.P.; Kim H.; Kwon O.J.  
Dr. G.Y. Suh, Div. of Pulmon./Critical Care Med., Department of Medicine,  
Samsung Medical Center, 50, Ilwon-Dong, Kangnam-Ku, Seoul, 135-710  
South Korea  
AUTHOR EMAIL: gysuh@smc.samsung.co.kr  
Tuberculosis and Respiratory Diseases ( TUBERC. RESPIR. DIS. )  
(South Korea) 01 JAN 2003, 54/1 (71-79)  
CODEN: KHCHA ISSN: 0378-0066  
DOCUMENT TYPE: Journal ; Article  
LANGUAGE: KOREAN SUMMARY LANGUAGE: ENGLISH; KOREAN  
NUMBER OF REFERENCES: 11

Background: A bronchoalveolar lavage(BAL) is useful in diagnosing the etiology of bilateral pulmonary infiltrations, but may worsen the oxygenation and clinical status in severely hypoxic patients. This study assessed the safety and efficacy of the **continuous positive airway pressure ( CPAP )** using a conventional mechanical ventilator via a face mask as a tool for maintaining the oxygenation **level** during BAL.

Methods:  
Seven consecutive patients with the bilateral pulmonary infiltrates and severe hypoxemia (PaOSUB2FIOSUB2 ratio <=200 on oxygen 10 L/min via mask with reservoir bag) were enrolled. The **CPAP** 5-6 cmHSUB20(FSUBIOSUB2 1.0) was delivered through an inflatable face mask using a conventional mechanical ventilator. The **CPAP** began 10 min before starting the BAL and continued for 30 min after the procedure was completed. A bronchoscope was passed through a T-adapter and advanced through the mouth. BAL was

performed using the conventional method. The vital signs, pulse oxymetry values, and arterial blood gases were monitored during the study.

Results:

(1) Median age was 56 years(male:female=4:3). (2) The baseline PaOSUB2 was 78+/-16 mmHg, which increased significantly to 269+/-116 mmHg( $p=0.018$ ) with **CPAP**. After the BAL, the PaOSUB2 did not decrease significantly but returned to the baseline **level** after the **CPAP** was discontinued. The SpOSUB2 showed a similar trend with the PaOSUB2 and did not decrease to below 90% during the duration of the study. (3) The PaCOSUB2 increased and the pH decreased significantly after the BAL but returned to the baseline **level** within 30 min after the BAL. (5) No complications directly related to the BAL procedure were encountered. However, intubation was necessary in 3 patients(43 %) due to the progression of the underlying diseases.

Conclusion: In severe hypoxic patients, **CPAP** using a face mask and conventional mechanical ventilator during a BAL might allow minimal alterations in oxygenation and prevent subsequent respiratory failure.

18/7/9 (Item 2 from file: 73)

DIALOG(R)File 73:EMBASE  
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11489272 EMBASE No: 2002060719

**Lung carbon dioxide elimination correlates with physiologic dead space volume during mechanical ventilatory support**

Sungur M.; Guven M.  
M. Sungur, Erciyes Universitesi Tip Fakultesi, 1c(cedil)  
Hastaliklari  
ABD, Kayseri 38039 Turkey  
Turkish Journal of Medical Sciences ( TURK. J. MED. SCI. ) (Turkey)  
2001, 31/6 (529-532)  
CODEN: TJMEE ISSN: 1300-0144  
DOCUMENT TYPE: Journal ; Article  
LANGUAGE: ENGLISH SUMMARY LANGUAGE: ENGLISH  
NUMBER OF REFERENCES: 10

Increased mean airway pressure (PSUBaw) predisposes to increased alveolar dead space volume and, hence, physiologic dead space volume (VSUBDphys). This is the result of overdistending alveoli, converting Zone 2 and Zone 3 units to Zone 1 units. Lung **carbon dioxide** elimination (LCOSUB2) is a reflection of pulmonary capillary blood flow. It is hypothesized that

as

Zone 1 units form or VSUBDphys increases, LCOSUB2 decreases proportionately

and eventually PaCOSUB2 increases, The purpose of this study is to determine if LCOSUB2 correlates with VSUBDphys during mechanical ventilation. Six sheep (66.3 +/- 6.5 kg), anesthetized with sodium thiopental and paralyzed using pancronium, had pulmonary artery and arterial catheters inserted, and were intubated and ventilated

[Fraction of

inspired oxygen of 1.0, controlled mechanical ventilation]. Acute lung injury was induced by tracheal instillation of hydrochloric acid (pH 2.5,

0.25 mL/kg). **Continuous positive airway pressure (CPAP)**

levels of

5, 10 and 20 cm H<sub>2</sub>O were randomly applied. Cardiac output was maintained

nearly constant at all **CPAP** levels. Data from flow/pressure and **infrared**

capnometer sensors, positioned between the endotracheal tube and the "Y"

piece of the breathing circuit, were directed to a commercially available

respiratory monitor (Novametrix), which provided real time display of PSUBaw and LCOSUB2 (area under the exhaled volume and COSUB2 curve integrated over 1 min). VSUBDphys and the physiologic dead space volume to

tidal volume ratio (VD/VT), calculated using the single breath COSUB2 elimination technique, were also displayed on the monitor. Data were analyzed using regression analysis; alpha was set at 0.05 for statistical

significance. Conclusion: **CPAP** increases PSUBaw, which correlated positively with VSUBDphys. LCOSUB2 correlated negatively and PaCOSUB2 correlated positively with VSUBD/VSUBT. At VSUBD/VSUBT of approximately

0.5. LCOSUB2 began decreasing and PaCOSUB2 increasing, LCOSUB2 is simple to

measure, and real time data provides useful clinical information, i.e., a

noninvasive inference of changes in VSUBDphys and PaCOSUB2 following application of positive pressure.

18/7/10 (Item 3 from file: 73)

DIALOG(R)File 73:EMBASE

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03164144 EMBASE No: 1986141721

Indirect calorimetry in artificially ventilated children. Part 2: A

new

device and its test performance in a new developed metabolic lung model

INDIREKTE KALORIMETRIE BEI BEATMETEN KINDERN. 2. TEIL: EIN MESSVERFAHREN

UND SEINE UBERPRUFUNG AN EINEM NEUENTWICKELTEN STOFFWECHSEL-

LUNGENMODELL

Semsroth M.

Klinik fur Anasthesie und Allgemeine Intensivmedizin, A-1090 Wien  
Austria

Infusionstherapie und Klinische Ernahrung - Forschung und Praxis (INFUSIONSTHER. KLIN. ERNAHR. FORSCH. PRAX. ) (Switzerland) 1985,

12/6

(294-303)

CODEN: IKEFA

DOCUMENT TYPE: Journal

LANGUAGE: GERMAN SUMMARY LANGUAGE: ENGLISH

A new device for continuous measurement of oxygen uptake (V.(O<sub>inf</sub> 2)) and

**carbon dioxide** elimination (V.(CO<sub>inf</sub> 2)) in artificially ventilated or

**CPAP** -system breathing children has been developed. A dual-channel analyzer

system based on zirconium oxide cell measures oxygen fractions. This allows

not only single measurements but also continuous determination of fraction

differences for oxygen (Delta F(O<sub>inf</sub> 2)) (accuracy +/- 0,003 Vol%).

**Carbon**

**dioxide** is measured by **infrared** absorption. A mixing device for inspiratory gas was designed to smooth fluctuations of inspired oxygen fractions almost completely. The reliable sampling system for expiratory

gases has already been described. The breathing-e.g. ventilating-system was

modified in such a way that the total gas flow is independent of mode and

breathing volume (equally 15 l/min). For this purpose we use a self aspirating, time-cycled, volume limited respirator or a high-flow-

**CPAP**

-system. The prototype described ran test performances on a specially developed pneumatic metabolic-lung-model. This new lung model enables free

choice of respiratory quotient (R) by independent setting of O<sub>inf</sub> 2-uptake

and CO<sub>inf</sub> 2-elimination. Under these controlled laboratory conditions gas

volume-balances correspond to expected values in children as shown during

simulated trials. In the metabolic-lung-model accuracy and reproduction

averaged +/- 1% for V.(CO<sub>inf</sub> 2). Both were independent of the mode of ventilatory support, F(IO<sub>inf</sub> 2), and R. Determinations of V.(O<sub>inf</sub> 2) were

more dependent on F(IO<sub>inf</sub> 2) and R. After computing primary data according

to a special formula which equalizes differences between V.(I) and V.(E)

the maximal error was +/- 7%. Maximum difference between preset and

measured R-values ranging from 0.769 to 1.429 was -4.6%, determined at R = 1.429. By means of this independent test series insights into clinically expected measurement errors and dimensions of limits of accuracy could be demonstrated. It seems to be justified that our newly developed device for accurately measuring Oinf 2-uptake and COinf 2-elimination is highly recommendable for use in extremely difficult conditions as in ventilated children.

18/7/11 (Item 1 from file: 155)

DIALOG(R)File 155: MEDLINE(R)  
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07485938 PMID: 3937811

**[Indirect calorimetry in artificially respirated children. 2. A measuring procedure and its evaluation in a newly developed metabolism-lung model]**

Indirekte Kalorimetrie bei beatmeten Kindern. 2. Teil Ein Messverfahren und seine Überprüfung an einem neu entwickelten Stoffwechsel-Lungenmodell.

Semsroth M  
Infusionstherapie und klinische Ernährung (SWITZERLAND) Dec 1985, 12  
(6) p294-303, ISSN 0378-0791 Journal Code: 7613112  
Publishing Model Print

Document type: Journal Article ; English Abstract  
Languages: GERMAN  
Main Citation Owner: NLM  
Record type: MEDLINE; Completed  
A new device for continuous measuring oxygen uptake (V02) and carbondioxide elimination (VCO2) in artificially ventilated or CPAP-system breathing children has been developed. A dual-channel analyzer system based on zirconiumoxyd cells measures oxygen fractions. This allows not only single measurements but also continuous determination of fraction differences for oxygen (delta FO2) (accuracy +/- 0.003 Vol%). Carbondioxide is measured by infrared absorption. A mixing device for inspiratory gas was designed to smooth fluctuations of inspired oxygen fractions almost completely. The reliable sampling system for expiratory gases has

already been described [19]. The breathing-e.g. ventilating-system was modified in such a way that the total gas flow is independent of mode and breathing volume (equally 15 l/min). For which purpose we use a self aspirating, time-cycled, volume limited respirator or a high-flow- **CPAP** - system. The prototype described ran test performances on a specially developed pneumatic metabolic-lung-model. This new lung model enables free choice of respiratory quotient (R) by independent setting of O<sub>2</sub>-uptake and CO<sub>2</sub>-elimination. Under these controlled laboratory conditions gasvolume-balances correspond to expected values in children really as shown during simulated trials. In the metabolic-lung-model accuracy and reproduction averaged +/- 1% for VCO<sub>2</sub>. Both were independent of the mode of ventilatory support, FIO<sub>2</sub>, and R. Determinations of VO<sub>2</sub> were more dependent on FIO<sub>2</sub> and R. After computing primary data according to a special formula which equalizes differences between VI and VE the maximal error was +/- 7%. Maximum difference between preset and measured R-values ranging from 0.769 to 1.429 was -4.6%, determined at R = 1.429. By means of this independent test series insights into clinically expected measurement errors and dimensions of limits of accuracy could be demonstrated. It seems to be justified that our newly developed device for accurate measuring O<sub>2</sub>-uptake and CO<sub>2</sub> -elimination is highly recommendable for use in extremely difficult conditions as in ventilated children.

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18/7/12 (Item 1 from file: 35)

DIALOG(R)File 35:Dissertation Abs Online

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01270267 ORDER NO: NOT AVAILABLE FROM UNIVERSITY MICROFILMS INT'L.  
SLEEP RELATED RESPIRATORY DISORDERS IN PATIENTS WITH CHRONIC  
OBSTRUCTIVE

PULMONARY DISEASE (COPD) AND OBSTRUCTIVE SLEEP APNEA SYNDROME (OSAS):

**EFFECTS OF CONTINUOUS POSITIVE AIRWAY PRESSURE VIA THE NOSE**

**(N-**

**CPAP ), ALONE AND ASSOCIATED WITH OXYGEN**

Original Title: ALTERACIONES RESPIRATORIAS DURANTE EL SUEÑO EN PACIENTES

AFECTOS DE BRONQUITIS CRONICA OBSTRUCTIVA Y SINDROME DE APNEAS OBSTRUCTIVAS DEL SUEÑO. EFECTOS DE LA APLICACION DE PRESION POSITIVA

CONTINUA EN LAS VIAS AEREAS POR VIA NASAL, SOLA Y ASOCIADA A OXIGENOTERAPIA

Author: SAMPOL RUBIO, GABRIEL

Degree: MED.D.

Year: 1990

Corporate Source/Institution: UNIVERSITAT AUTONOMA DE BARCELONA (SPAIN)

(5852)

Source: VOLUME 54/01-C OF DISSERTATION ABSTRACTS INTERNATIONAL.  
PAGE 205. 180 PAGES

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Publisher: SERVEI DE PUBLICACIONS DE LA UNIVERSITAT AUTONOMA DE BARCELONA, EDIFICI RECTORAT, APARTAT POSTAL 20, E-08193

BELLATERRA (BARCELONA), SPAIN

In order to know the sleep related respiratory disorders in patients with COPD + OSAS, the effects of n- **CPAP** and the feasibility of associated oxygen with n- **CPAP** were studied in 16 men affected with both diseases during three consecutive nights.

On the first night we performed a polysomnography (electroencephalogram + electro-oculogram + chin electromyogram + respiratory thoracic and abdominal effort by inductance plethysmography + detection of airflow + electrocardiogram + arterial oxygenation by pulse **oximetry** ); 2nd night: polysomnography + progressive pressure **levels of** n- **CPAP** + radial artery catheterization; 3rd night: polysomnography + n- **CPAP** + oxygen applied into the mask of n- **CPAP** + radial catheter.

Mean apnea-hypopnea index was 47 (25), hypopneas were frequent: in 8 patients their number were greater than the number of apneas, and four of them had an apnea index  $\leq 1$  apnea/hour of sleep. All the patients presented desaturations caused by apnea or hypopnea. Furthermore they also presented desaturations not related to these events with a mean frequency of 17.6 (12.6) during n-REM sleep) and 10.7 (13.1) (during REM sleep)

and a duration greater than the observed in the desaturations caused by apnea or hypopnea. Desaturations secondary to apnea were the most severe during n-REM sleep as during REM sleep. Mean desaturation time was 39.7% (19).

The use of n- **CPAP** during the second night limited apneas, hypopneas and, by an unknown mechanism of action, the desaturations not related to apnea or hypopnea that showed a change from 17.6 (12.6) desaturations/hour to 4.4 (6) ( $p < 0.01$ ) during n-REM sleep and from 9.2 (6) to 5.2 (5) (p:n.s.) during REM sleep.

Despite the limitation of apneas, hypopneas and desaturations the application of n- **CPAP** did not achieve a correct hemoglobin oxygen saturation ( $SaO_2$ ) during sleep in our patients: 86.2% (5) (n-REM) and 83.6% (7.1) (REM). The association of oxygen, 1.5 (0.2) l/min, to n- **CPAP** showed to be effective:  $SaO_2$  increased to a mean value of 92.5% (2) ( $p < 0.01$ ) without involving greater values of arterial **carbon dioxide** or cardiac arrhythmias.

?

13/3, K/4 (Item 4 from file: 149)  
DIALOG(R) File 149:TGG Health&Wellness DB(SM)  
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01479799 SUPPLIER NUMBER: 15250307 (USE FORMAT 7 OR 9 FOR FULL TEXT)

Synchronized intermittent mandatory ventilation with and without pressure support ventilation in weaning patients with COPD from mechanical ventilation.

Jounieaux, Vincent; Duran, Alain; Levi-Valensi, Pierre  
Chest, v105, n4, p1204(7)  
April,  
1994

PUBLICATION FORMAT: Magazine/Journal ISSN: 0012-3692 LANGUAGE: English  
RECORD TYPE: Fulltext TARGET AUDIENCE: Professional  
WORD COUNT: 4058 LINE COUNT: 00424

TEXT:

...intermittent mandatory ventilation (SIMV) with pressure support ventilation (PSV) (group 1) or SIMV alone (group 2). The volumetric support of ventilation (SIMV rate) was progressively **decreased** in both groups according to the patient's tolerance with a concurrent **decrease** in the barometric support of ventilation (PSV levels from 15 cm [H.<sub>sub.2</sub>]O to 6 cm [H.<sub>sub.2</sub>]O). At each step...

... patients with COPD often do not tolerate discontinuation of mechanical ventilation (MV) due to the combination of a number of factors.[3] During ARF, the **increase** in both inspiratory and expiratory flow resistances results in an **increased** mechanical load for the respiratory muscles, and leads to intrinsic positive end-expiratory pressure (PEEP) which acts as an inspiratory threshold load. Concurrently, the hyperinflation...

...diaphragm which then operates on a less efficient portion of its force-length curve.[4] So, COPD patients in ARF have to cope with an **increased** work of breathing that has to be overcome by respiratory muscles which are in a disadvantageous position.[5] Furthermore, MV itself may aggravate intrinsic PEEP,[6] may **increase** the mechanical load by the resistances of endotracheal tube and respirator circuitry,[7] and can be so considered as an additional burden for the respiratory...

...constant preset positive airway pressure during spontaneous inspiration. As in IMV, spontaneous breathing with PSV requires the patient to open the demand valve which might **increase** the work of breathing.[12] However, Brochard and coworkers[13] have shown that PSV reduces significantly the work imposed on the respiratory muscles. Therefore, an...

...performed. When patients with COPD had successfully undergone this procedure, they were extubated.

In group 1, PSV was added throughout the weaning period and four **decreasing** levels, arbitrarily chosen, were used concurrently with the **decrease** in SIMV rate: 15 cm [H.<sub>sub.2</sub>]O at 10 cycles/min step; 12 cm [H.<sub>sub.2</sub>]O at 8 cycles/min step...airways pressure exceeds the PSV level by 1.5 cm [H.<sub>sub.2</sub>]O. In both groups, appearance of clinical signs of respiratory muscle fatigue ( **increased** in spontaneous breathing frequency [S<sub>f</sub>], alternating abdominal and rib cage breathing, paradoxical inspiratory inward motion of the anterior wall of the abdomen, or sweats),[17...

...H.<sub>sub.2</sub>]O). No sedative, narcotic, or analeptic drugs were administered.  
Measurements

At each step of SIMV rate (ie, at each 2 cycles/min **decrease**), several measurements were performed when a ventilatory steady state was achieved on semirecumbent position: average systolic blood pressure (SBP)

and heart rate (HR) from repeated...

...were evaluated and arterial blood gases were sampled when the steady state was achieved for the step.

The oxygen cost of breathing (OCB) was concurrently **determined** by a technique of indirect calorimetry similar to that of Harpin and coworkers.[18] Inspired and expired gas samples were taken, respectively, from the inspiratory and expiratory lines of the respirator. Oxygen and **carbon dioxide levels** were continuously **measured** using, respectively, a polarographic and an **infrared** gas analyzer (Ergotest Jager with sensitivity of [+ or -] 0.02 percent, two-point gas calibration done before each run) during two periods of 5 min and average values **calculated**. All volumes were corrected to STPD conditions. Oxygen consumption ( $[VO_{\text{sub.2}}]$ ) was evaluated using the following equation:

[Mathematical Expression Omitted] where  $[FE_{\text{O}}_{\text{sub.2}} \text{ period (SB period), Sf and SVE significantly increased in both groups concurrently to the recovery in respiratory autonomy (Fig 2). In the SIMV/PSV group, SVT remained constant throughout the study despite decreasing levels of PSV (Fig 1) and no correlation was found between the PSV levels and SVT. In group 2 patients, SVT did not change throughout...}$

...SIMV/PSV and SIMV groups in the OCB ( $[VO_{\text{sub.2}}]_{\text{resp}}$  and  $[VO_{\text{sub.2}}]_{\text{resp}}$  percent, Fig 3). Of course, the OCB significantly **increased** in both groups from F.10 step to SB step concurrently to the **increase** of the spontaneous ventilation (Fig 3). When the  $[VO_{\text{sub.2}}]$  is expressed per liter of ventilation, it significantly **increased** from F.10 step to SB step in patients without PSV, whereas it **decreased** in patients with PSV (Table 3 and Fig 4).

At the end of this study, all patients with COPD were extubated as they had undergone...

...new criteria have not been independently validated.

Because we had been unable to successfully wean or extubate these patients, we decided to propose a gradual **decrease** in both the volumetric (SIMV) and barometric (PSV) assistances of ventilation during the weaning period. The SIMV rate was **decreased** in a standard way, once or twice a day, depending on the patient's tolerance. This was based on published clinical signs of respiratory muscle...

...the oxygen cost of spontaneous breathing. This is usually less than 5 percent of the  $[VO_{\text{sub.2}}]_{\text{tot}}$  in normal subjects breathing quietly, but **increases** in patients with COPD and in patients undergoing artificial ventilation.[26] Indeed, we found high values of OCB in COPD patients when breathing spontaneously via...the respirator (Puritan Bennett 7200) induces an additional inspiratory work ranging from 10 to 40 percent. Fiastro and coworkers[37] predicted that a 1-mm **decrease** in the tube diameter results in a 67 to 100 percent **increase** in this work. Nevertheless, low PSV level (6 cm  $[H_{\text{sub.2}}]_0$  or 8 cm  $[H_{\text{sub.2}}]_0$ ) did not significantly **decrease** the OCB of our patients.

The only objective benefit of PSV appeared when considering  $[VO_{\text{sub.2}}]_{\text{resp/SVE}}$  which represents the oxygen cost per liter of spontaneous ventilation and expresses the efficiency of the ventilation.[18] The  $[VO_{\text{sub.2}}]_{\text{resp/SVE}}$  significantly **decreased** across the weaning period in group 1 whereas it significantly **increased** in group 2 (Table 3 and Fig 4). Pressure support ventilation could improve the efficiency of the ventilation when added to SIMV. As PSV had...

...and accelerated the recovery in lung mechanics. This could explain why SVT remained constant throughout the weaning period despite the degressive PSV levels and the **decrease** in  $[VO_{\text{sub.2}}]_{\text{resp/SVE}}$ . Nevertheless, these

suggestions remain speculative as we did not measure the lung mechanics. The interpretation of our results depends...27

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Set	Items	Description
S1	26	AU='RICHEY J B'
S2	277	CPAP OR CONTINUOUS?() POSITIVE() (AIR OR AIRWAY) () PRESSURE? ?
S3	1	S1 AND S2
S4	1014466	SENS???
S5	95330	CARBON() DIOXIDE OR CO2
S6	116772	INFRARED OR INFRA() RED
S7	1264	S4(3N)S5
S8	1	S6 AND S7 AND S2

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Set	Items	Description
S1	16176	CONTINUOUS() POSITIVE
S2	416653	VENTILAT?
S3	2274	S1(5N)S2
S4	14555	CONTINUOUS?() POSITIV?() (AIR OR AIRWAY?) () PRESSUR?
S5	10662	CPAP
S6	17951	S4 OR S5
S7	507481	CARBON() DIOXIDE OR CO2
S8	812	S6 AND S7
S9	10043312	LEVEL? OR THRESHOLD? OR PARAMETER?
S10	17987	S7(5N)S9
S11	29	S8 AND S10
S12	15	RD (unique items)
S13	6888417	THRESHOLD? OR VALUE? OR PARAMETER?
S14	7444007	LEVEL? ?
S15	13782	S7(5N)S14
S16	16	S6 AND S15
S17	8	S13 AND S16
S18	4	RD (unique items)
S19	32036	THRESHOLD(2N) VALUE?
S20	27	S15 AND S19
S21	0	S6 AND S20
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Set	Items	Description
S1	17736	CPAP OR CONTINUOUS() POSITIVE() AIRWAY() PRESSURE?
S2	507481	CARBON() DIOXIDE OR CO2
S3	1418956	SENSE? ? OR SENSOR OR SENSING
S4	2089	S3(5N)S2
S5	4446744	DETECT???
S6	3878	S5(5N)S2
S7	0	S1 AND S4
S8	3	S1 AND S6
S9	2	RD (unique items)
S10	31362	OXIMET?
S11	53	S1 AND S2 AND S10
S12	28	RD (unique items)
S13	10043312	THRESHOLD? OR LEVEL? OR PARAMETER?
S14	5	S12 AND S13
S15	568528	INFRARED?
S16	8	S1 AND S2 AND S15
S17	6	RD (unique items)
S18	12	S9 OR S14 OR S17
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S1	20604	CPAP OR CONTINUOUS() POSITIVE() (AIR OR AIRWAY) () PRESSURE
S2	686343	CARBON() DIOXIDE OR CO2
S3	9773822	LEVEL? ?
S4	3771798	THRESHOLD? ? OR PARAMETER? ?
S5	14537570	INCREAS??? OR DECREAS???
S6	3491879	PRESSURE? ?
S7	18681234	SENS??? OR DETERMIN? OR MEASUR??? OR CALCULAT???
S8	828149	INFRARED OR OXIMET?
S9	15232	S2(3N)S3
S10	4814	S7(S)S9
S11	14	S1 AND S5 AND S10
S12	4	S8 AND S11
S13	4	RD (unique items)
S14	366	S7 AND S2 AND S3 AND S1
S15	110	S8 AND S14
S16	71	S4 AND S15
S17	68	RD (unique items)
S18	6614	S2()S3
S19	1841	S5 AND S7 AND S18
S20	14	S1 AND S4 AND S19
S21	14	RD (unique items)
S22	23	S11 OR S21
S23	20	RD (unique items)
S24	17795157	ANALYS? OR ANALYZ?
S25	923593	ANALIS? OR ANALIZ?
S26	17888879	S24 OR S25
S27	2566273	GAS
S28	186966	S27(2N)S26
S29	3687	S8(5N)S28
S30	1033	S2 AND S29
S31	9	S1 AND S30
S32	9	RD (unique items)
S33	8	S32 NOT S22
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